

## IN THE CLAIMS

What is claimed is:

1 1. A semiconductor device, comprising:

2 a semiconductor substrate;

3 an isolation film buried in the substrate;

4 a gate insulating film formed between the isolation film and having  
5 end portions adjacent to the isolation film that are thicker than a central  
6 portion.

1 2. The semiconductor device according to claim 1, further including:

2 a trench in the semiconductor substrate between adjacent gate  
3 insulating films and having a width essentially the same as the distance  
4 between the adjacent insulating films; and

5 the isolation film is buried in the trench.

1 3. The semiconductor device according to claim 1, further including:

2 a first electrode formed on the gate insulating film;

3 a capacitance insulating film formed on the first electrode; and

4 a second electrode formed on the capacitance insulating film.

1 4. The semiconductor device according to claim 1, wherein:

2 an upper surface of the isolation film is at substantially the same height  
3 as an upper surface of the end portion of the gate insulating film.

1 5. The semiconductor device according to claim 1, wherein:

2 an upper surface of the isolation film is higher than an upper surface of  
3 the end portion of the gate insulating film.

1 6. The semiconductor device according to claim 1, further including:

2 a first electrode formed on the gate insulating film and having a  
3 recessed portion at a central first electrode portion between the isolation film.

1 7. The semiconductor device according to claim 1, wherein:

2 the semiconductor device is a flash memory.

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of the stacked film patterns wherein the second oxide film has a film thickness thicker than the first oxide film;

forming a side wall mask film on a side of the stacked film patterns to form mask patterns including the stacked film patterns;

removing the portion of the second oxide film sandwiched between the mask patterns and a portion of the underlying semiconductor substrate using the mask patterns as a mask to form a trench in the semiconductor substrate;

and

filling the trench with an insulating film.

9. The manufacturing method of a semiconductor device according to claim 8, wherein:

the step of filling the trench with an insulating film includes forming the insulating film to have a top surface having a height that essentially matches with a height of the second oxide film.

10. The manufacturing method of a semiconductor device according to claim 8, further including the steps of:

forming a capacitance insulating film on the surface including the first conductive layer after the step of filling the trench with an insulating film; and forming an electrode on the capacitance insulating film.

**11.** The manufacturing method of a semiconductor device according to claim 8, wherein:

the side wall mask film includes a nitride film.

1 12. The manufacturing method of a semiconductor device according to claim 8, wherein:

2 the second oxide film is approximately 20 to 50 nm thicker than the first oxide  
3 film.

1 13. The manufacturing method of a semiconductor device according to claim 8, wherein:

2 the stacked film includes a stopper film that provides a stopper for a  
3 chemical mechanical polishing step.

1 14. A manufacturing method of a semiconductor device, comprising the steps of:

2 forming a first oxide film on a surface of a semiconductor substrate;  
3 depositing a stacked film including a first stopper layer on the first  
4 oxide film;

5 etching the stacked film and the first oxide film to form a plurality of  
6 stacked film patterns arranged on the semiconductor substrate;

7 oxidizing the semiconductor substrate to form a second oxide film on a  
8 surface of the semiconductor substrate sandwiched between adjacent stacked  
9 film patterns and a surface of the semiconductor substrate below end portions  
10 of the stacked film patterns wherein the second oxide film has a film thickness  
11 thicker than the first oxide film;

12 removing the portion of the second oxide film sandwiched between the  
13 mask patterns and a portion of the underlying semiconductor substrate using  
14 the stacked film patterns as a mask to form a trench in the semiconductor

15 substrate; and  
16 filling the trench with an insulating film.

1 15. The manufacturing method of a semiconductor device according to claim 14,  
2 wherein:  
3 the step of filling the trench with an insulating film includes forming  
4 the insulating film to have a top surface having a height that essentially  
5 matches with a height of the first stopper layer.

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1 16. The manufacturing method of a semiconductor device according to claim 14, further  
2 including the steps of:  
3 removing the stacked film patterns so that at least the second oxide  
4 film below the stacked film patterns remain;  
5 forming a gate oxide film in a region between the second oxide film;  
6 forming a first electrode over the gate oxide film and at least a portion  
7 of the second oxide film.

1 17. The manufacturing method of a semiconductor device according to claim 16,  
2 wherein:  
3 the first electrode includes end portions next to the insulating film that  
4 are higher than a central portion of the first electrode.

1 18. The manufacturing method of a semiconductor device according to claim 16,

2 wherein:

3 the insulating film has a top surface that substantially matches with a  
4 top surface of the first electrode.

1 19. The manufacturing method of a semiconductor device according to claim 16, further  
2 including the steps of:

3 forming a capacitance insulating film on the first electrode; and

4 forming a second electrode on the capacitance insulating film.

1 20. The manufacturing method of a semiconductor device according to claim 16,  
2 wherein:

3 the first electrode includes polysilicon.

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